Challenge Paper *The Challenge Dialogue System™*

Inventory Program Review: A Challenge Dialogue with Stakeholders

BC Ministry of Forests and Range

Executive Co-Sponsors —

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Note to Participants: Please use the accompanying IPR Challenge Paper Feedback Form to provide your response to this Challenge Paper. Your response is required as soon as possible and no later than April 12, 2006

Copies of this Paper and the Feedback form may be downloaded until April 12th from http://www.for.gov.bc.ca/hts/inventory_prog_rev.htm

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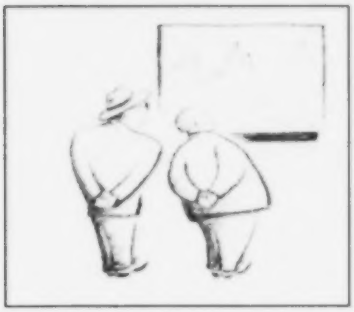
Tracking the progress of the IPR



I don't exactly know what it means, but I love the action."

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Abbreviations

AAC	Allowable Annual Cut
AOAs	Archaeological Overview Assessments
CDS	Challenge Dialogue System
CWD	Course Woody Debris
EBA	Ecosystem Based Management
FG	Free Growing
FAIB	Forest Analysis and Inventory Branch (MOFR)
FREP	FRPA Resource Evaluation Program
FRPA	Forest and Range Practices Act
FIA	Forest Investment Account
G&Y	Growth and Yield
IPR	Inventory Program Review
LIBC	Land Information BC (formerly)
LRDW	Land and Resource Data Warehouse
LUP	Land Use Plan
MOE	BC Ministry of Environment
MOFR	BC Ministry of Forests and Range
MPB	Mountain Pine Beetle
NFI	National Forest Inventory
NVAF	Net Volume Adjustment Factors
OAF	Operational Adjustment Factors
PEM	Predictive Ecosystem Mapping
PSP	Permanent Sample Plot
RISC	Resource Information Standards Committee
SIBEC	Site Index – Biogeoclimatic Ecological Classification
SIGY	Southern Interior Growth and Yield Co-operative
SFM, SFMP	Sustainable Forest Management/Plan, SFM Plan
TASS	Tree and Stand Simulator
TEM	Terrestrial Ecosystem Mapping
THLB	Timber Harvesting Land Base
TFL	Tree Farm License
TRIM	Terrain Resource Information Management
TSA	Timber Supply Area
TSR	Timber Supply Review
VDYP	Variable Density Yield Prediction

VRIMS	Vegetation Resource Information Management System
VRI	Vegetation Resource Inventory

Forward — This Challenge Paper

The Inventory Program Review (IPR) is following the *Challenge Dialogue System (CDS)* — a flexible but disciplined process for engaging diverse stakeholders to collaborate and innovate in accomplishing complex tasks. In this instance the process consists of 5 steps: (1) initial scoping by the project Action Team, (2) expanded dialogue with a wide range of stakeholders, (3) workshops with stakeholders to clarify the challenge and identify some key action options, (4) options development and analysis, and (5) recommendations to executive and direction to implement. The outputs from Step 1 are in Appendix 1. We are now beginning Step 2 with the distribution of this *Challenge Paper*.

The purpose of this Challenge Paper is to prompt a meaningful electronic conversation around the Key Challenge stated in the first section among those stakeholders in industry, government, First Nations and private sector firms who represent largely the users and, in some cases, providers of vegetation information in the province. This initial Dialogue will set the scene for one or more focused workshops planned for the first quarter of fiscal 2006.

The Challenge Paper is not meant to be a fully polished business report or rigorous "technical paper". Rather, it is intended to be a working document which, in a short period of time, has cobbled together different pieces of information from a variety of sources to help get everyone on the same page, and to serve as a basis to begin a purposeful Dialogue around this important review.

We have little doubt that the Challenge Paper contains errors and misinterpretations. That's alright and in fact we are counting on you, the participant in the electronic Dialogue, to note them and to set us straight. This paper advances some important assumptions that we want to test with you — the things that "go without saying" — and some initial questions concerning the Key Challenge. Have fun thinking about the challenge. We appreciate your help and look forward to receiving your reactions and ideas for improving the inventory for the present and as we prepare for new challenges and opportunities in the future.

Sponsors

Jim Snetsinger, Chief Forester and Tim Sheldan, Assistant Deputy Minister, Operations Division, serve as executive sponsors of the Inventory Program Review. The Operations Division Management Team has given its endorsement of the project.

The Forest Analysis and Inventory Branch (FAIB) and the project Action Team will provide project leadership with appropriate involvement of Operations Division personnel. FAIB will be responsible for reporting out to both ADMs as the review progresses. It will also ensure that the process provides the opportunity for continued input from a wide spectrum of stakeholders.

Terms

The term "inventory" is used in this Challenge Paper to imply a range of information types including, point-in-time (snapshot) inventory, often in map form, inventory updating activities, time-series monitoring, models forecasting future conditions, particularly growth and yield, and associated sampling for these activities.

The focus of this Challenge Paper is on the vegetation inventory. The vegetation inventory currently is focused on forested areas and does not include range lands. A parallel Dialogue later on will look at range land inventory. The Vegetation Resource Inventory (VRI) is the current data standard that supports vegetation inventory in BC.

The vegetation inventory forms an information layer that is georeferenced to TRIM. The inventory information is typically presented in conjunction with other information such as base map features — roads, rivers, settlements, etc. — in order to provide important geographic context. The vegetation inventory is manifested in different forms: map (GIS), database including polygon attributes, orthophotos with vegetation cover delineations, standard reports, sample reports such as stand and stock tables or volume and decay analysis.

Scope

The IPR encompasses all facets of the vegetation inventory program as supported by the VRI standard. It consists of forest/vegetation cover, done to VRI standards; VRI update; Phase 1 VRI (photo interpretation) and Phase 2 VRI (ground sampling); Net Volume Adjustment Factoring sampling (NVAF); growth and yield; site productivity; vegetation information specific to management of the Mountain Pine Beetle; and all related or dependent inventories, studies and assessments.

The scope of this review is not limited to the activities of FAIB, MoFR or government. We want to take a broad perspective beyond government to ensure all aspects of the program are included and the needs and roles of the principle stakeholders are considered.

We are focusing on the vegetation inventory because of its prevalence and importance to the forest sector. It was our opinion that to broaden the scope of the project to include all resource inventories would have reduced the effectiveness of the review given the resources available. However we are interested in comments related to other related resource inventories and will either use them in this process or pass them on to the appropriate custodians.

MOFR is initiating or contemplating separate reviews of other inventories within its jurisdiction including Forest Recreation Inventories, Traditional Use Studies, Range Inventories and the National Forest Inventory (monitoring). We also recognize the close linkages if not dependencies between the vegetation inventory and ecosystem mapping (terrestrial ecosystem mapping (TEM) and predictive ecosystem mapping (PEM)). In this regard, we look forward to the results of a

complementary Ecosystem Mapping Challenge Dialogue that is currently being planned by the Ministry of Environment within a similar timeframe as the IPR.

Finally, we welcome feedback on the governance and delivery models for the inventory program and on how they might better articulate goals and objectives, assign roles and responsibilities and capitalize on available resources from multiple sources.

Starting Perspectives

Governance:

- Current legislation sets inventory requirements differently for different forests within the province:
    - TFL holders must meet inventory requirements set by the Chief Forester.
    - Licensees outside of TFL have no such requirement, although there is an expectation that comments in TSR Determinations regarding the inventory will impact future inventory investments.
    - In both cases, due diligence under FRPA infers decision-making based upon sound information.
- Government sets the standards for inventories which are funded by government.

Delivery Model:

- For TFLs: the licensees are responsible for funding inventory requirements set by the Chief Forester (Forest Act Section 9). Where Government standards as set by Government Data Custodians exceed the requirements of the Chief Forester, the TFL Holders may choose to augment their inventories to meet the Government standards using government funding.
- For TSAs: Government funds the collection of inventory information. Government also houses and provides access to the information subject to various constraints. Government relies on a subset of forest tenure holders to plan, collect, quality assure and submit to government, forest inventory data.

Funding Model:

- Prior to 1995, the funding and delivery of inventories outside of TFLs were undertaken directly by government. The forest cover inventory was by far the largest data set in existence at the time.

- From 1995 – 2001, Forest Renewal BC provided funding to ministries and industry to undertake inventory work. In 2002 FRBC was replaced by the Forest Investment Account (FIA). Funding was allocated first at the regional level and then at the management unit level and required government and industry to collaborate on investment planning and project delivery. FRBC funding levels were highly volatile and therefore not well suited to effective inventory program planning and implementation.

- From 2002 to the present, FIA allocates funding directly to individual forest tenure holding "recipients" who then determine the optimum mix of investments. Local decision-making and flexibility to move funding from one area of the province to another with minimal government involvement are seen as the primary benefits of this model. The delivery model is not well suited to regional or provincial programs such as forest health, Growth and Yield and it appears, vegetation inventory. Unfortunately, as with all government programs, FIA funding has also been very volatile ranging from a high of $146 million to a low of $85 million.

Decision-making at different scales warrants different degrees of quality (spatial & attribute accuracy, currency). The VRI has been implemented to support management unit (TFL or TSA) level decision-making. This assumes that only a subset of any given MU will require stand level information appropriate for spatial analysis and for those stands that do, stand level assessments such as timber cruises will be done by those that require the higher resolution information.

However, with the advent of GIS, spatial modeling at that stands level based upon the VRI has become very popular with forest managers even in the absence of stand level assessments. The VRI standards for more intensive sampling could be applied to provide higher resolution data for these uses, however this is seldom done for cost reasons. Alternatively, a more intensive operational cruise methodology may be used, but this is not tied to the inventory.

Vegetation condition changes over time causing the inventory database to "age" and become out-of-date. The inventory therefore must be regularly updated and periodically re-inventoried when and where there is a demand for the inventory to be more current.

Many planning and management decisions in today's work environment rely almost exclusively on the maps that are updated and maintained by staff with limited knowledge of local conditions. Local field knowledge of the inventory has diminished significantly. Further, there is an increasing reliance on the forest industry and other third parties to help maintain the inventory.

In advance, we with to thank you for whatever time you are able to contribute to this important review.

IPR Action Team

When reviewing the many changes and challenges in the forests and in forestry at the December 6, 2006 Future Forests Symposium, Doug Konkin, Deputy Minister of Forests and Range, asked —

I'm left with the question, is our current forest management paradigm responsive enough to the rapidly changing world we find ourselves in? And what is the risk associated with changing our current management paradigm? Or, not changing it?

Challenge Paper

Inventory Program Review (IPR): A Challenge Dialogue with Stakeholders Who Need Critical and Timely Vegetation Information

1. Key Challenge Being Addressed in this Challenge Dialogue

To undertake a full and open review of the current implementation of the vegetation inventory program[1] in order to examine how well it meets current and future[2] information needs and how it can be improved to address these needs better:

- by engaging a range of inventory stakeholders in a structured dialogue to establish common background, test assumptions, ask important questions and identify other issues and opportunities;
- by drawing upon the expertise of technical inventory professionals in the public and private sector to respond to opportunities to improve processes and products and to address identified gaps; and
- by striking a balance between thinking outside the box and recognizing where current systems continue to serve our needs well (not throwing the baby out with the bath water).
- by balancing desired change with affordability. We will never eliminate risk, but we must manage it.

Addressing this Key Challenge will help to affirm/refine and build a rational, stakeholder-based case for the inventory "mandate." It will also provide a basis to re-examine the effectiveness and efficiency of the current delivery model.

At various points in the Challenge Paper you will be asked for your reaction and further input. The separate *Challenge Paper Feedback Form* (MS-Word) pulls together all these input requests and invites you to e-mail your contribution to the IPR Responses by March 29, 2006

[1] While the term "program" is used here, it implies that an existing cohesive program current exists. Most people involved with the current inventory "program" feel it is neither complete nor cohesive.

[2] For, example the next 10-15 years.

2. Expected Outcomes at the End of the Challenge Dialogue

The Action Team guiding this dialogue offers the following expectations for the participant's consideration. Resulting from the IPR the following outcomes will be realized.

1. A clear, broad view of current and anticipated vegetation inventory information needs and program delivery issues and opportunities from those that require and use the information to support decisions and planning from policy through to practices on-the-ground;;
2. The development and assessment of technical and program delivery options that will best address the issues; and
3. Clearer understanding and statement of the business case and barriers for vegetation inventory investments from both government and licensee perspectives.
4. A better understanding of the range of practical solutions to the issues and opportunities identified; and
5. A renewed strategic direction (vision, mission and mandate) for the province's vegetation inventory program.

INPUT REQUEST 1: Please use the separate *Feedback Form* to provide your feedback (reactions, questions, suggestions) to the Expected Outcomes.

Do you have any comments you would like to make about our Forward section regarding terms, current scope and assertions.

What questions do you wish to raise about the Key Challenge statement?

What ideas did the Key Challenge statement spark in your mind?

What reactions, questions or suggestions do you have with regard to the Expected Outcomes?

What expectations do you have for this Challenge Dialogue (as in:" I would consider this Dialogue a success if...")?

3. Background Issues and Events That Have Led to This Key Challenge

3.1 IPR and Related Initiatives

1. **The purpose of the IPR is assess the following:**
   a. needs and expectations for the program now and in the foreseeable future,
   b. strengths and vulnerabilities of the program related to those expectations,
   c. opportunities for improving the program, and

d. stakeholder support and executive endorsement for implementing the necessary improvements.

2. IPR Initiatives: Parallel to or supporting the IPR are the following inventory reviews and supporting studies that are ongoing or planned.
   a. Other inventories: A range inventory program review is being led by Laura Blonski, Range Ecologist in Operations Division, Prince George (Contact: Laura.Blonski@gov.bc.ca) and a recreation inventory review will be led collaboratively by John Wakelin, FAIB and Jacques Marc, Forest Practices Branch, MOFR (Contacts: John.Wakelin@gov.bc.ca and Jacques.Marc@gov.bc.ca);
   b. Mapping of Inventories (TSA level index maps showing the extend of each inventory including VRI, TRIM, PEM, TEM and Visual Landscape Inventory (VLI):
   c. A VRI business process mapping exercise will begin in April. (Contact: Don.Gosnell@gov.bc.ca). This will be used to inform any process re-engineering that results from the IPR.

3. Mountain Pine Beetle Area Inventory & Monitoring Action Plan. The provincially funded Forests for Tomorrow (FFT) program, and the federally funded Mountain Pine Beetle Emergency Response – Canada-BC Implementation Strategy, provide opportunities to address inventory and monitoring knowledge gaps in MPB affected areas. Building on the June 2005 report *Strategies for Forest Inventory and Monitoring in MPB Areas*, a MPB Inventory and Monitoring Action Plan is now in final stages of completion under the guidance of a government and industry working group. This plan will guide the investment of funds on critical and timely information needs in direct support of *BC Mountain Pine Beetle Action Plan* 2005-2010. At a January 2006 workshop hosted by FAIB in cooperation with the Council of Forest Industries and MOE, some 30 participants developed a draft set of plans across five priority theme areas: Beetle Attack and Other Pathogens; Decay (mortality, declining value), G&Y and Succession; AAC (strategic) & Harvest Scheduling (spatially explicit); Silviculture – Strategic & Spatially explicit Planning; and Non-Timber Values. A draft integrated set of priority projects have now been identified within and across these theme areas with budget estimates for fiscal year 2006-07. Contact: Graham Hawkins Graham.Hawkins@gov.bc.ca .

4. **Timber Supply Determinations and Inventory Issues.** As part of the preparation for the IPR, FAIB undertook a study to review the inventory and G&Y issues that affect timber supply forecasts and subsequent AAC determinations identified in Timber Supply Review AAC Rationale reports. The study identified eleven (11) issues including the topics of site productivity; existing unmanaged stand volumes; priority areas for VRI Phase 1; decay, waste and breakage (NVAF); site productivity from alternative silviculture systems; forest health affects on site productivity (OAFs); stand dynamics outside the timber harvesting land base – e.g., inoperable areas, parks (THLB); better handling of NSR; treatment of values stemming from traditional use studies and archaeological overview assessments (AOAs); roles and responsibilities regarding in particular other inventories that affect timber supply analysis.

5. **ABCFP Resource Inventory Review.** As a result of concerns expressed by some foresters and others regarding the state of the resources inventories in BC, the Council of the Association of BC Forest Professionals (ABCFP) directed association staff to put out a call to the membership to solicit comments on the state of the inventories. An initial set of comments

were received in late October 2005. The general consensus among the respondents was that there are serious problems with resource inventories. The Association's current plan is to undertake a more thorough examination guided by a task force. The ABCFP is aware of the IPR work and the two initiatives have agreed to share their findings so that a more complete picture of the situation can be attained from both perspectives. It is important that the Association maintain independence from the government, hence the continuation of the two somewhat parallel processes. Contact Dwight Yochim for more information: dyochim@abcfp.ca.

3.2 *Vegetation Inventory*

6. **Genesis of the VRI** — The Forest Resources Commission report of 1991 led to the development of the VRI standard, a statistically sound inventory standard for timber and other vegetation attributes. The VRI standard was implemented in 1998.

7. **Defining the Vegetation Inventory** — there are three questions that the vegetation inventory attempts to answer:
    a. How much do we have?
    b. Where is it located?
    c. How does it change through time?

    The VRI standard was designed to address these questions for both timber and non-timber vegetation and associated ecological attributes at a strategic, management unit level.

8. Seven inventory activities address these three questions:

    To the question — *how much do we have, we use three tools:*

    a. Phase 1 photo interpretation delineates vegetation and also estimates several attributes of the vegetation within each polygon from which we can estimate "how much".
    b. Phase 2 ground samples provide the descriptive statistics of the inventory. Only a small sub-set of polygons are sampled in Phase 2. Stratification of polygons and rigorous sampling methodology ensures that the desired statistical reliability is achieved.
    c. NVAF, Net Volume Adjustment Factor sampling, validates the estimates from Phase 2 sampling of net volume in each sample tree. NVAF sampling requires that the Phase 2 samples have been installed.

    To the question — *where is it, we deploy a single tool:*

    d. Phase 1 photo interpreted inventory includes the acquisition of appropriate photography, delineation of vegetation polygons and estimation of several vegetation attributes. Phase 1 photo interpreted estimates are adjusted using the Phase 2 sample data to improve the reliability of the resultant information.

    To the question — *how does it change through time, we need four tools:*

    e. Update, a process of tracking ongoing change to forest cover polygons due to logging activities, catastrophic fire and insect/diseases infestation. Historically the

emphasis has been placed on updating the inventory for harvest related depletions. Natural disturbance tracking has been intermittent at best.

f. Site Productivity, a process to determine the site productivity of a polygon, and to audit/monitor that the estimates of site indices for young stands within a TSA are correct.

g. Yield projection, a process that uses site index along with the attributes of the polygon to estimate future stand conditions, including timber volume. Validation of spatially explicit adjustment factors is also a component of yield projection.

h. Monitoring, a process to validate our assumptions and estimates in the field through a series of representative plots that provide for repeated measures over time of the variables of interest.

9. **VRI has been implemented to support management unit level decision-making.** The primary reason for this is cost. While VRI attempts to estimate stand level information, it is meant to be rolled up for strategic level analysis. It designed to give general answers over a large area. The accuracy of the polygon estimates depends on the quality of the photo interpretation, the statistical validity of the ground sampling and the accuracy of site index curves used to project growth. The VRI is predicated on using estimation and adjustment techniques with a limited amount of measured ground data. The longevity (change in accuracy over time) of an adjustment has never been tested.

10. **VRI as a spatially explicit inventory.** Although the VRI is designed to be implemented at any level, most implementations (1:20,000 - 30,000 scale imagery) support strategic level decision making processes, e.g., TSR, Land Use Plans, etc. Any applications of VRI that depend on the information being correct at stand or polygon-specific level may be unreliable for the reasons stated above.

11. **Timeframe for completing a VRI.** The timeframe required to complete all phases of a VRI for a management unit typically requires three to four field seasons. During the first field season, acquisition of photos or digital images occurs with processing completed in the fall and delineation carried out in the winter and spring months. In the second field season, the photo interpretation fieldwork is completed with estimation of attributes and mapping completed in the fall and winter months. In the following spring, sampling design for the Phase 2 is carried out. In the third field season, ground sampling is completed with the adjustment factors developed and inventory file adjustments made in the winter months. The timeframe might be shortened by combining or overlapping the photo and field work.

12. **Lifecycle of the VRI.** Currently, there is no re-inventory cycle in BC. The inventory cycle (a new inventory on a regular cycle) concept was introduced in the late 1980s and a number of inventories were done to pre-VRI standards. With the implementation of the VRI in the mid 1990s and with the previously noted changes in government policy, it was planned that the entire province would be covered on a cycle of about 10 years. To date, the first cycle is far from complete.

13. **Site Index.** Site productivity is estimated from photo interpretation for each VRI polygon using estimated age and site height (the term "top height" is not used) and models maintained by the MOFR Research Branch (SITETOOLS). Ground sampling later adjusts the

age and height for each polygon and a new Site Index is calculated. For young stands with reasonable regeneration, other tools are used such as SIBEC or growth intercept methods. These young stand estimates are carried on the inventory file and are not changed.

14. **Vegetation Monitoring.** Government has not articulated a clear business driver for monitoring at the management unit level, hence there are no Resource Information Standards Committee (RISC)-approved provincial vegetation monitoring protocols in place. The consulting community has undertaken about a dozen monitoring pilots to date, largely implemented on second growth managed stands. The intent of these pilots is to supply data suitable to test (validate) output from G&Y and site productivity models, but no decision to provincially adopt the procedures has been made. These pilots are referred to as "change monitoring inventories" and utilize the National Forest Inventory (NFI) standards. Typically a proponent will install about 50 fixed area tree plots on a grid in selected strata. The data are intended mainly to check managed stand yield output from models such as TIPSY. There is an assumption that the plots will be re-measured to get growth data after five to ten years. Monitoring data uses could include: checking G&Y model output, checking VRI adjustment longevity, observing general trends in the inventory, biodiversity change, climate change, changes in the land base, etc. Observing differences between successive inventories does not, for the most part, qualify as "true" monitoring due to differing inventory standards, sampling issues, etc., that may have been applied between inventories. Whatever future direction is taken, forest monitoring needs to be either linked or embedded within the basic inventory design.

15. **Young stands.** There is a gap in good inventory information between the period of free-growing (10 to 20 years) and early to mid rotation. The inventory label assigned at free-growing comes from the silviculture surveys. These polygons are not ground truthed until after age 30 and even then, with very limited sampling. The VRI, as it has been implemented, may not adequately address growth of young stands.

16. **Current VRI Coverage.** Although made spatially explicit in 1998, only about 1/3rd of the province has been re-inventoried to VRI standards. The remainder has either the old forest cover inventory with data converted to look like VRI data or it is within the TFLs where a number of companies maintain their inventories to their own vegetation inventory standards. Factors for lack of VRI investment include:

    a. Competition for funding: many other resource information needs now compete for the scarce funding that historically was targeted at the forest cover inventory.

    b. Legislative and Policy Change: The major impacts from legislative and policy change are associated with government policies such as "freedom to manage", "professional reliance" and optional participation in the Defined Forest Area Management initiative. Each of these added to the fragmentation of the program Removing the legislated responsibility for inventories from the *Forest Act* in 2001 was more a matter of housekeeping than policy. The removal was in reaction to the reorganization of government which included the consolidation of resource inventory programs to another agency. Now that MOFR is again responsible for VRI, the question of adding the former Section 4 back into the Ministry of Forests Act should be considered.

c. The rationalization of government and industry capacity has also compromised the program in recent years. The team directly supporting the inventory within government was reduced by 60% in 2002-03. Most companies now rely heavily on contracted expertise to support their information needs. The effect in both situations is a significant loss of local and corporate knowledge about the inventory.

17. **Timber Emphasis.** Of the 4500+ VRI or so ground samples established since 1998, fewer than 500 are installed to include the full suite of attributes (ecosystem attributes, CWD, etc.) resulting in a timber inventory focus only.

18. **Volume and Decay.** The Provincial Forest Inventory Program maintained an active volume and decay function since the 1950's. This program area was responsible for developing tree-level models and factors to estimate volume and losses from decay. V&D databases are comprised of over 100,000 historic tree records that are used for developing new products such as taper models. With the introduction of the VRI, the emphasis of this work area shifted to supporting the sampling and developing of Net Volume Adjustment Factors.

19. **Operational Adjustment Factors (OAFs).** Most predictive tools are developed from data with unknown sampling probabilities and as a result are considered to be biased. OAFs are developed from unbiased sampling and are used to adjust model outputs to reflect "reality". There is no consolidated government standard or program support for OAFs, however, industry often retains consultants to develop OAFs, often in the area of site productivity, forest health or managed stand yields.

Appendix 2 provides further background to the current VRI Program.

3.3 Growth & Yield

20. **Genesis of G&Y.** In BC, recognition of G&Y's role in crown forest management began early: *"No thorough study has yet been made of the rate of growth of our timber on difficult sites. I propose paying some attention to this work during the coming year, in order that some opinion may be formed as to the length of time necessary to grow a second crop in logged and burned districts".* H.R. MacMillan, BC's first Chief Forester; Annual Report, Forest Branch, 1915.

A G&Y function was established in the inventory program in 1961 with the start of the Permanent Sample Plot (PSP) Program that is still active. Interest in G&Y research began even earlier (1920"s). G&Y modeling arrived in the 1970's with an emphasis on supporting forest estate modeling efforts. G&Y activity is largely restricted to government, academia and a few large companies.

21. **Components.** G&Y represents a suite of tools, data and knowledge used to predict current and future tree-based characteristics at the tree, stand, or forest level. G&Y's main applications are in forest planning, silviculture, forest health and inventory. Within inventory, G&Y provides predictions of current inventory attributes that are not (easily) estimated directly (e.g., timber volume, site index, etc). G&Y is also used to project the inventory into the future under various management scenarios to support AAC determinations, SFM planning and silviculture investment decisions.

22. Legacy. Before obligation transfers to licensees began in 1987 (reforestation), government held primary responsibility for forest management on crown lands and accepted the role of primary steward and custodian for G&Y. Forest industry's early G&Y investments were largely confined to private land and area-based tenures, reflecting associated forest management responsibilities and incentives (e.g., timber supply analysis and silviculture investment). Today, the province's accumulated G&Y investment legacy includes over 9,000 active permanent sample plots and hundreds of research installations that continue to contribute to the refinement of G&Y models and knowledge to address evolving SFM business needs in BC.

23. Current Reality: In the late 1990s, budget pressures and other factors caused government to downsize its G&Y staff and investments. At the same time, government forestry funding initiatives (FRBC, FIA, etc) radically reconfigured G&Y funding and delivery models. A previously centralized G&Y program was fragmented and its components distributed across several funding (sub) programs, each with a unique niche and delivery model. As strategic management capability and linkages among program components deteriorated, stakeholders with G&Y business needs found themselves increasingly isolated from G&Y investment decisions. With the current lack of G&Y investment, over 2,000 PSPs have not been re-measured to schedule and most work in the areas of site productivity and new model development has suffered.

3.4 Related Inventories

24. National Forest Inventory. BC continues to contribute to the National Forest Inventory (NFI) coordinated by Natural Resources Canada. The NFI is a national level vegetation inventory and monitoring program designed to supply information at the provincial/national level. Many of the National Forest Inventory (NFI) ground sampling standards were adapted from BC's VRI model. The NFI has a plot location design based on a 20 km grid system. In British Columbia there are approximately 2,400 grid intersections, about 1,200 of which fall on either forested areas or areas that have the potential to be forested (the population of interest). At each grid intersection point, a vegetation cover photo sample has been established within a 2km x 2km plot. Within approximately 10% of the photo samples, a detailed ground sample is established. BC has now completed the establishment phase and is investigating re-measurement procedures. The NFI photo and ground plots re-measurement cycle is 10 years.

25. Terrestrial Ecosystem Mapping (TEM) of site series has been undertaken on a number of forest areas. Driven largely by challenges with cost plus the allure of technologies, Predictive Ecosystem Mapping (PEM) was introduced as a semi-automated and more repeatable approach to TEM. Both field and polygon delineation processes with PEM use vegetation inventory information. At the same time, some vegetation inventory work has incorporated more ecological attributes and in some cases has attempted to integrate the mapping of vegetation with the delineation of ecosystems. Joint VRI/TEM standards are available.

INPUT REQUEST 2: Please use the separate *Feedback Form* to provide your feedback (reactions, questions, suggestions) to the Forward, Key Challenge and Background statements.

What critical information or perspectives on the Background are confusing to you? Are there any other issues or events that you feel should be added or that are not relevant?

When responding, please refer to the Background statements by their number.

4. Assumptions Driving this Challenge Dialogue

4.1 Inventory Program Review

1. **Forestry in BC continues to experience unprecedented and new challenges.** The challenges are many including heightened global competition, access to markets, community expectations and First Nations interests; managing the right balance of ecosystem values – water, habitat, species, soils, etc.; predicting the affect of changing economic conditions on fibre utilization, mill strategies; bioenergy opportunities; tenure systems; and forest management models; etc. And, overlaid on top of this are the catastrophic effects of the natural agents of fire, insects and pathogens and the increasing evidence of a changing climate. Against this new forest reality at the Future Forests Symposium on December 6, 2005, the Chief Forester and Deputy Minister of MOFR challenged the participants to *evaluate the current management paradigm to determine how we can prepare to manage our forests in the future*. We are assuming that this IPR is therefore one, among a number of dialogues that need to occur to surface some concrete responses to this challenge. We in turn must ask — are we providing the right, critical and timely information to inform planning and decision-making today and what improvements in our approaches and what new inventory information do we need in the future?

2. Inventory staff feels that important improvements can be made to the inventory program to make it more effective and efficient.

   a. The inventory is being implemented to support management unit level decision-making yet is being used for spatial analysis at the stand level, resulting in risky decisions. It is

not apparent that planners and managers are aware of how much uncertainty there is in using the inventory in this way.

b. There are many gaps in the information (coverage and content) and many of the assumptions used to support the projections are of unknown accuracy. For example:

    i. The inventory was designed assuming all components would be completed on each management unit. But in practice many units have only one or two components completed or planned for completion. For example:

        i. A Phase 1, but no Phase 2;

        ii. Phase 2, but no NVAF;

        iii. Site productivity data gaps and/or Growth and Yield data gaps which result in uncertainty of projected changes to the inventory over time.

    ii. The Phase 2 component was design to collect a suite of vegetation attributes in addition to timber (soils, ecology and wildlife). In practice, only 500 of 4500 ground plot samples collected to date include the full suite of attributes. How has this practice affected the utility of the inventory?

    iii. The objective for the inventory was to provide an estimate of the extent and nature of vegetation across the province irrespective of ownership. Yet 10 year after the inventory was initiated, less than 30% of the province has been covered and many areas including protected areas and private land is excluded. Is this acceptable?

    iv. The Timber Supply Rationales from the Chief Forester indicate a continuing trend of the investment model in not responding adequately to his vegetation inventory concerns. This is clearly not acceptable, but who is accountable for remediation?

c. The business needs of industry are not completely aligned with those of government. Further, with government reorganization, industry consolidation and tenure reallocation, changes there is a constant change of personnel. These factors challenge the creation and maintenance of good working relationships between inventory practitioners.

d. Under the current funding model, some management units will not likely see investment in a vegetation inventory.

e. Recent inventory program downsizing has created a severe capacity issue both in government and industry.

f. There are too few government personnel to fully carry out the custodial responsibilities they are tasked with.

g. The forest industry and consulting sector do not have all of the necessary expertise and capacity to carry out inventory work that government wants to have delegated to the private sector.

3. MOFR is leading the IPR at this time because of several overarching assumptions.

a. The VRI was designed primarily to support the responsibilities of the Chief Forester while acknowledging that it would be of benefit to other forest managers inside and outside of government.

b. The recent return of vegetation inventory staff and resources to MOFR from the Integrated Land Management Bureau (MSRM) means some inventory-related roles and responsibilities need to be affirmed or sorted out a little further.

c. There is a need to test and re-affirm a number of the assumptions on which current inventory systems were designed and/or implemented.

d. The current inventory is being used in the absence of local field knowledge to support business decisions it was not designed and/or implemented for.

e. As custodian of the information, FAIB staff think they have identified a number of key areas that need attention but we need to test and affirm these with stakeholders before taking any action. Appendix 1 provides a summary of some of issues identified by inventory staff based on a cursory evaluation in December 2005.

f. The value of inventory information is recognized as being significant enough to warrant support for change where a clear business case can be demonstrated.

4. The IPR will focus on the following.

   a. Inventory requirements of forest managers and of the chief forester for AAC determinations.

   b. Inventory requirements for management of other forest and resource values by government, industry and communities.

   c. Developing and implementing an achievable and sustainable program to that sees progressive improvements being made within a realistic timeframe and foreseeable resources, technologies and delivery model.

5. The IPR will aim to strike a balance between identifying where current methods and systems continue to serve needs well versus where new possibly innovative approaches will be needed. Some approaches to improving the program may be too disruptive or too expensive to be implemented. As MoFR is ultimately accountable for the funding and implementation of the vegetation inventory, a thorough benefit over costs analysis will need to be completed for each approach before a recommendation is taken to Executive for decision.

4.2 Vegetation Inventory

6. The VRI standards can be applied at any scale. Due to cost and capacity considerations, it has been implemented utilizing 1:20,000 – 1:30,000 scale photography and minimal stratified ground sampling (100 – 200 plots per MU) to provide for statistical reliability at a management unit level. This model assumes that where stand level accuracy is critical, additional stand level sampling will occur. Typical examples of such sampling are operational cruises and silviculture prescriptions.

7. The original designers of the VRI envisioned the ability for local "new" information to be used to adjustment the inventory[3]. However this feature has not been accommodated in the existing design.

8. The vegetation inventory database is very large and complex such that any change to existing standards has significant time and financial implications. Any proposed changes to data models and underlying databases must have a benefit over cost ratio of greater than 1 and must be affordable. Imminent changes with computer systems (workstation refresh within government) and the implementation of the Vegetation Resource Information Management System — VRIMS (from INCOSADA) add additional data management challenges and uncertainties. The inventory information demands caused by the MPB attack also suggest that more efficient data management protocols are necessary. Although it remains unclear what the solutions are.

9. The VRI will continue to be a key data set used for both strategic and, in the absence of more appropriate information - stand-level decision-making. Knowledge of the processes used to produce the polygons and their attribute labels and associated data is critical for ensuring appropriate judgment is applied when using the information.

10. The Resource Inventory Standards Committee (RISC) committee has not been active for the past 3+ years, however, the RISC website is still an important tool for government and industry to access RISC approved standards. RISC was disbanded as there were very few standards being brought forward and those that were generated no comment. The other duties of the committee had also become redundant. Note: under the former LIBC Data Custodian Council, a decision was made that bound all custodians (in LIBC) to adhere to RISC procedures when amending an existing, or creating a new, data standard. With the demise of LIBC, data custodians are no longer bound by that decision.

11. The original designers of the VRI envisioned a seamless inventory for the entire province[4]. The implementation however, has not accomplished this objective. TFLs may or may not adhere to VRI standards and the basic components of the inventory are often the private property of the TFL licensee and therefore not available for integration purposes. Gaps in TSAs, woodlots, parks and managed forest lands will continue to restrict objective assessments of the state of the province's forests and comparisons of performance from one management unit to another.

12. The current FIA Land Base Investment Program local delivery model is ineffective for implementing regional or provincial investment strategies and will not provide government with the inventory information it needs to carry out its stewardship responsibilities. Poor overall coordination has caused inconsistent investment decisions.

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[3] Final Report from the Vegetation Inventory Working Group on a Proposed New Inventory. p. 45

[4] Final Report from the Vegetation Inventory Working Group on a Proposed New Inventory. p. 8

13. FIA Land Base Investment Program funds are generally directed to inventory projects which will have a short term benefit to the "funding recipient' (e.g., AAC uplift potential or mitigation of a constraint).

14. For many reasons, managers in all parts of the sector must rely on less than perfect inventory information. However, there does not appear to be a minimum quality standard that must be achieved before a decision-maker can consider it. While this situation can be rationalized as being in the best short term interests of the public, it begs the question: Is it in the public's long term interest and if not, what minimum standard must we achieve and by when?

15. If all sources of Provincial and Federal Government and industry funding for inventory and G&Y activities were rationalized, coordinated and planned cooperatively there is a greater probability of achieving the quality objectives of the inventory users. Governance and delivery activities should involve major providers of inventory and G&Y information, with direct or indirect means for participation by stakeholders.

16. A business case for investment in inventory and G&Y information will require analysis of the risks inherent in the current information, and their implications for good forest stewardship. Until we do this we will not be able to assess value for money nor provide the appropriate incentives for Treasury Board or other stakeholders to make these investments.

17. As we develop the new vision of the VRI, should we be thinking in more holistic terms towards the management of timber and ecosystems? We think so.

18. Projection of the inventory requires estimates of growth and these estimates come these days largely from G&Y information. Ecosystem mapping (TEM or PEM) and tools like SIBEC, together with VRI contribute to answering the what, where and how much questions referred to earlier. It therefore stands to reason that each forms one component of the vegetation inventory program and should be managed as such (that is, together, not in isolation).

19. In recent years, better approaches to PEM and TEM are realizing improved accuracies and greater consistency. They now use enhanced modeling techniques, image interpretation tools and more reliable data sources. The ability to map ecosystem conditions in a more automated manner with higher accuracies and with lower costs over offers the potential for better interpretation and prediction of timber and non-timber values to support ecosystem-based management (EBM). These include interpretations in the areas of site productivity, silviculture strategies and planning (species selection and diversity, climate change scenarios), terrain-hydrology-related interpretations, wildlife habitat, species at risk, etc.

4.3 Growth & Yield

20. Our claims to sustainability rest on our ability to predict future forest values under alternate management regimes. G&Y knowledge and predictions play a central role in the practice of sustainable forest management (SFM) in many business areas. G&Y is not just about timber anymore – it includes an understanding of forest dynamics from the perspective of multiple

resources. Stand structure predictions from G&Y models are key inputs for predictions of many future non-timber values including habitat, bio-diversity, visual quality, etc.

21. The rapid evolution of SFM practices continues to increase expectations for G&Y knowledge and tools. Early G&Y work focused mainly on yesterday's clear-cut paradigm. However, the MPB epidemic and ecosystem-based management practices, such as variable retention, require estimates of G&Y under complex stand conditions. The number of stakeholders and G&Y business drivers continues to expand and tax existing tools and knowledge. The business case for G&Y has never been stronger or more diverse.

22. As Crown land steward, government is publicly accountable for SFM. Long-term G&Y investments (e.g., permanent sample plots and modeling programs) align with government's long-term stewardship and SFM responsibilities. In contrast, licensees do not have an incentive to make long-term G&Y investments except where they are able to capture the benefits of those investments. Government and licensees may have different investment perspectives, but they share many of the same G&Y business drivers:

    a. Today's high-profile SFM issues including mountain pine beetle, ecosystem-based management and Aboriginal treaty settlements.
    b. Timber supply planning: AACs, harvest scheduling, mill supply.
    c. Silviculture investment decisions:
    d. Reforestation: licensee obligations; Forests for Tomorrow.
    e. Stand tending: mitigate/enhance timber and non-timber supplies.
    f. FRPA Forest Stewardship Plans: stocking standards
    g. Wood quality and value implications.
    h. SFM planning and validation processes: SFMPs, land-use plans, C&I, certification, FRPA-FREP, etc.
    i. Research, Extension and Education applications.
    j. Linkages with resource inventories and other business data systems (*RESULTS*, *GENUS*, etc).

INPUT REQUEST 3: Please use the separate *Feedback Form* to provide your feedback (reactions, questions, suggestions) to the Assumption statements.

What assumptions require more clarification for you to understand?

What assumptions do you strongly disagree with? What is your position on the issue?

What assumptions would you like to add?

Please refer to the Assumption statements by their number.

5. Critical Questions

1. **Inventory Program Review** — we are at early stage of the review process; do you think this kind of review is appropriate and that it will be useful? What are your thoughts on its scope? Note – we see inventory and G&Y being integrally linked. Are there other related or influencing initiatives we should be aware of that should be linked? How would you finish the sentence: *This review will be worthwhile if….?*

2. **Today's Priority Business Needs** — Within the context of this review (topic and scope), what you rate as your top 3-5 most important and critical planning and decision support needs that you would expect to have met from the vegetation inventory today? What new management questions does the inventory need to address now?

3. **Future Business Needs** — if you think to the future, 5 years from now and beyond, what changing or new inventory requirements do you anticipate needing? What specific changes to your business do you see causing these changes?

4. **Priority Inventory Services & Products** — what are the top 3-5 services and products most critical to your business needs now? I.e. if we were to change anything, what do we need to keep? What do you see as the most limiting factors with the provision of these?

5. **Different Inventories for Different Circumstances** — Thinking about the diverse nature of both our forests, how they are managed and by whom, what risks or gaps are inherent in the existing inventory that you think must be addressed?

6. **TFL, Park & Private Land Inventories** — should a provincial vegetation inventory program include TFLs, parks and private forest land to facilitate land use planning, optimizing biodiversity opportunities and taking a systems approach to resource management (e.g. MPB)? If so, what is the best approach for acquiring the data and creating a seamless inventory? Should they use the same standards? At what level? Note – for example, the standards for certain attributes within a park may apply a different level of precision than a private forest since the inventories may have a different primary objective. But once attributes are mapped, or summarized to the same standards, would the resultant not meet most business needs?

7. **Accuracy Expectations** — Considering that this program is not intended to replace stand level assessments such as operational cruises, for the items you listed in questions 2, 3 and 4, what data quality[5] are you expecting of this inventory? What information about the inventory (AKA metadata) would improve the way the inventory is used?

[5] Quality includes: spatial accuracy (is it mapped properly), attribute correctness (is it labeled correctly?), statistical accuracy (where sampling and estimation exist) and currency (where change over time is a factor)

8. **Information Access** — are you finding that you are able to access inventory information reasonably easily and in a timely manner, for example from the Land and Resource Data Warehouse or other access points?

9. **Delivery Model, Roles, Coordination** — How efficient and effective is the current inventory delivery model? Are the roles and responsibilities[6] of government, industry, the consulting sector and NGOs sufficiently clear and coordinated? Are inventory activities coordinated at the appropriate scale/level – e.g., province, region, management unit, etc? Who should be responsible to manage, fund and conduct the inventories?

10. **Incremental Improvements, Technology, Innovation** — considering question 6 and 7, what incremental improvements would you want to see in the inventory? Is the inventory program capitalizing on new technology appropriately? In what areas could the program be more innovative to improve its effectiveness and efficiencies? Depending on your organizational situation, would you be prepared to help support incremental improvements or innovations with funding support, provision of expertise or other in-kind contributions? Do we collectively have the resources and ability to support new technology?

11. **Value of Inventory Information** — is the value of the inventory understood and recognized by those who benefit from it and is the worth commensurate with the value of resources inventoried? Are we extracting the full value out of the inventory information? How strong is the business case for the inventory?

12. **Capacity, Succession, Training** — what are the inventory capacity, succession and training challenges that are must be addressed in the short term?

13. **Preliminary Inventory Issues Identified by Inventory Staff** — In December 2005, government inventory staff developed a cursory list of some important issues. They are listed in Appendix 1. Please take a moment to review these and share with us you reactions.

14. **Are there other points you would like to make**?

INPUT REQUEST 4: Please use the separate *Feedback Form* to provide your feedback (answers, reactions, further questions, suggestions) to the critical questions.

What other questions would you to raise?

Please refer to the Questions by their number.

[6] For example, standards, data collection/capture, data sharing and ownership, access, and innovation.

6. Next Steps

The above material establishes a starting point for our Dialogue. Consider all of this information as a work-in-progress. Your reaction to this information is very important. The following outlines the next steps in the Dialogue. Please note carefully the deadlines for receiving feedback.

1. This Challenge Paper (PDF) and Challenge Paper Feedback Form (MS-Word) are posted along with supporting documents to MOFR IPR website — http://www.for.gov.bc.ca/hts/inventory_prog_rev.htm

2. Closing date for responses March 29, 2006. Please send your responses using the feedback form directly to IPR Responses (Forests.ForestAnalysisBranchOffice@gov.bc.ca)

3. Response Compilation "as-is" and un-attributed posted to MOFR IPR Challenge Dialogue website on approximately April 5th, 2006.

4. Collation and analysis of submissions April 6 – 30, 2006. Synthesis of responses, key learnings and reaction of Champions in the form of Progress Report #1. Progress Report posted to MOFR IPR Challenge Dialogue website on approximately April 31, 2006.

5. Step 3 of the overall IPR process commences — face-to-face workshop(s) design, preparation of Workshop Workbook and delivery of Workshop(s) in May 2006.

6. Key outputs from the Workshop(s) will be posted mid-June 2006.

7. Issue teams will be formed following the workshop(s) to develop options and recommendations for MoFR Executive decision.

INPUT REQUEST 5: Please use the separate *Feedback Form* to provide any other miscellaneous comments or raise other questions.

Do you have any comments regarding the Next Steps?

What other perspectives would you like to add to this Dialogue?

APPENDICES

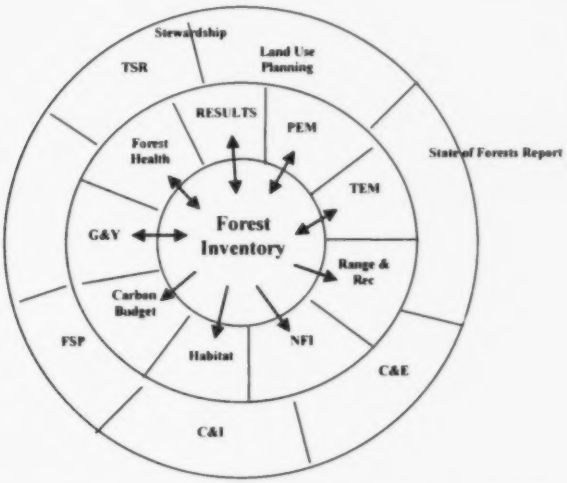
Appendix 1: Preliminary Inventory Issues Identified by Inventory Staff

In early December 2005, FAIB staff were asked to provide feedback on some inventory program issues. Following is a sampling of these preliminary discussions.

Inventory needs and business drivers — Change is a constant for the inventory program as new challenges unfold. Existing responsibilities (TSR, Phase 2 sampling) coupled with new business drivers such as the MPB and Treaty Negotiations are some of the current drivers. Many business drivers have been addressed independently such as the MPB inventory strategy and have not been considered particularly well in relation to the other "standard" drivers. The program needs to review all business drivers as in aggregate to determine where we are most at risk and what the priorities are overall. One major observation is that those who rely daily on the inventory no longer have any attachment to it. For example, district staff are not involved in its creation nor its maintenance and as a result no long have any feel for the data's condition. They also face serious barriers with accessing and using these data.

Funding models and the financial stability of the program — The Land Base Investment Program model assumes that all investments decisions can be made at the made at a sub-management unit level and that industry recipients will be guided effectively by government objectives when making these investments with no further government involvement being required. The model also assumes that funding will be stable and at a sufficient level to ensure effective forest stewardship. Government's objectives for LBIP have not proven to be effective at ensuring that government's inventory needs are met. LBIP funding has not been stable and has seen a 50% reduction since 2002. A different funding mechanism is needed to support inventory for regional or broader planning needs. Where industry is unable or unwilling to participate in these often broader stewardship drivers for inventory, government needs to take a lead role and have a say, particularly where decision risks are significant.

Linkages with other resource information and business areas — Linkages may be characterized as internal or external and either dependent or independent. These relationships are illustrated in the figure below. The middle ring around the centre "forest inventory" circle represents the main linked data sets — PEM, TEM, Range and Recreation, the National Forest Inventory (NFI), etc. The outermost ring represents the different business applications of these data. Each application may combine different combinations of middle ring and the forest inventory. The forest inventory has two-way relationships (shown as double-ended arrows) with some datasets while other datasets have relationships which do not feed back to the forest inventory. The growth and yield linkages need to consider both the collection and application of data to other resource information business needs. The inventory may be a source of surrogate data which will introduce a level of undetermined risk.



When considering internal linkages we need to consider how to limit our support for integrated data as it may detrimentally affect the capacity of the program to deliver its core business needs. Linkages to external users will generate different demands. Easy to use products, such as forest cover maps, must be readily available to meet external user needs. Other resource business needs may require more complex spatial and attribute information.

Roles and Responsibilities — Government has a stewardship obligation to maintain an inventory of the forest resources on Crown Land. Government has delegated authority to determine where and what type of investments will be made in forest inventories. This decision has not served the public well. The current funding model does not align well with "maintaining an inventory".

With the new and extensive MPB business driver, there is an opportunity to reconfirm the business model for identifying, prioritizing and resourcing inventory investments as well as the infrastructure and governance processes which will support it. Some opportunities areas include: (1) FC Update and VRI business areas need to be co-designed and co-located to ensure an effective program is realized; (2) the roles and responsibilities of all inventory program staff need to be examined and realigned to reflect the reality of the demographic trend (see succession below); (3) certification of staff, particularly in regions, needs to be reviewed and enhanced.

Inventory program planning and delivery model (options) — Currently FAIB, MOFR has little input into investment priorities. With little direct involvement in delivery, FAIB has become increasingly uncomfortable with data quality. Current investment decisions through LBIP are made locally at the management unit level. There are no linkages to provincial-scale strategies in this model and as a result, provincial strategies have not been maintained. Further, application of planning guidelines has been inconsistent. Strategic gaps persist in provincial VRI coverage.

Timber supply enhancement potential has become the main driver in many local investment decisions. On the other hand, investments to improve resource information that might reduce timber supply (e.g., forest health) tend to be avoided. Multi-licensee management units often have difficulty making joint investment decisions. DFAM has provided no new investment incentives, fiscal or policy. Local investors may opt for minimum sample sizes in order to allocate scarce FIA funds to other priorities.

Delivery capacity and expertise has been eroded by inventory staff reductions in all sectors. This erosion has been driven by industry cost-control, government re-alignment and loss of contractors due to a reduced and inconsistent flow of investments toward inventory.

Inventory Capacity — Prior to completion of the IPR, it is premature to identify what products are needed and hence what capacity. However, there are certain core roles and responsibilities that are considered to be essential elements of the program in order to fulfill government's stewardship responsibilities: (1) maintaining in-house expertise for advice to policy-makers and provincial and regional clients; (2) setting appropriate standards for inventories; (3) overseeing quality assurance; (4) undertaking audits; and (5) setting priorities for inventory work and for expenditures of public funds. These and other requirements established by the IPR will determine required skills and numbers, so that areas of surpluses and deficiencies can be defined.

An appropriate response to the capacity issue is seen as the biggest challenge facing the inventory program. Inventory is a very specialized activity that requires knowledgeable, experienced people not only in component technical fields but also as generalists. Capacity in all organizations province-wide in not documented but is believed to be at a much reduced level compared to a decade ago. There has already been a significant loss of specialists through elimination of inventory staff in the forest industry, and through staff reductions as part of government down-sizing. Staff in MOFR's inventory program now number less than 25% of a decade ago. The consulting community continues to have a sizeable but reduced capacity (down about 25% over the past 5 years) to undertake inventory activities, especially at the operational level, where they provide services to licensees who have eliminated their own internal staff.

Consultants could potentially expand to provide provincial-level inventory services, if there was a proven, consistent demand to justify the costs of training and retaining a specialized workforce. Reliance on consultants, however, may increase costs of doing inventory work because consolidations of consulting firms have reduced competition.

A challenge in rebuilding inventory capacity is competition for experienced staff with other jurisdictions. For example, following down-sizing in BC, numbers of experienced photo interpreters have taken positions in Ontario where government has been attempting to restore its inventory capacity. This follows an earlier unsuccessful attempt to transfer inventory responsibilities to the forest industry.

There are two questions that need to be answered as part of the capacity/succession issue: First, is the VRI going to address the "eco" side of inventory including coarse woody debris and eco attributes as recommended by the Forest Resources Commission? As a result of downsizing, VRI is now tending to focus on core timber values, with other attributes relegated to lesser importance. Returning to a full spectrum VRI will require substantial capacity-building. Second, will range management information take on a higher priority in future inventory activities?

Succession challenges with inventory expertise — whereas capacity deals with required staff levels and skills in relation to the job to be accomplished, succession focuses on retention of staff and replacement of key incumbents when they leave a position. It includes training, career-pathing, planned transitions for scheduled events such as retirements, and contingencies for unscheduled events such as employment changes or accidents. A case in point is the new VDYP7 initiative where retirements have created a critical gap in knowledge and the ability to support users. Other imminent retirements will lead not only to reduction in specialized knowledge throughout the program, but also to a loss of corporate memory. The first step in developing a succession plan will be to document and prioritize the key positions needed to meet the goals of the inventory program as defined through the Inventory Program Review. Succession strategies may include backup positions where resources are available, cross-training in critical functions and a formal process for knowledge transfer and continuation of on-going projects. The strategy must also address the loss of junior staff during down-sizing and the resultant vulnerability of the program to retirements.

Training and certification — an immediate need is for MOFR to step up its capability to undertake a training and certification program that is aligned with capacity building and the succession strategy. Because this role has been badly eroded in recent years in the absence of recruitments into entry-level inventory positions in government and in the consulting industry, it will be necessary to "train the trainers" as a starting point.

Standards — Data collection and capture standards exist for inventory and monitoring. We should continue to work with these standards as we explore and address changing business needs that are not adequately covered at the present time (e.g., MPB, remote sensing, digital camera standards). There is no government-required mandate for monitoring at the TSA level. We need to explore two approaches to determine which will best meet program needs and capacity: (1) results-based inventory with an audit function or, (2) standards or process-based inventory (government standards or user standards?). We may not have the capacity to address client requests to change existing government standards as there are often many implications. We may be unable to store information corporately if user standards differ significantly from the corporate warehouse standards – or face significant costs to change corporate storage standards. We will need to determine what non-standard information is or is not important for retention and how it will be retained – i.e. how it will be accessed for utilization with standard information on the corporate warehouse.

Data management — there is a need to re-confirm data management governance now that this function is back in MOFR but also need to sort out what the corporate strategy should now be, who is accountable, and who pays. Many challenges exist in the short and long term. In the short term we must — prevent loss of existing data, find ways to mitigate loss of corporate knowledge; recognize and manage both corporate and local data, and rebuild relationships with other business areas (e.g. Information Management Group). Longer term challenges include developing a more robust, flexible infrastructure and data structure that will efficiently accommodate integration of data as standards change over time.

Appendix 2. Background to the VRI "Program"

The following table prepared by Rick Baker, Eric Fisher and Jon Vivian provides a high-level appreciation of the Forest Analysis and Inventory Branch (FAIB) Vegetation Resources Inventory (VRI) Program to include Update and Loading functions. This material is intended to provide background information to assist the Inventory Program Review Team with their assignment.

High-level function	Program Component	Program Sub-Components	Comments
"Getting" the inventory (Capturing)	VRI Manager responsible: Vivian	• Phase 1 (photo interpretation) • Phase 2 (ground sampling & adjustment) • Phase 1 (NVAF)	• Photo data collection standards stable; database standards changing (see 'loading' below); most expensive aspect of VRI. • Ground data collection standards essentially stable; new adjustment standards to be implemented in 06; this will require us to re-evaluate some units to bring them to the new standard. • NVAF data collection standards stable; limited contractor base, especially for Q/A.
"Projecting" the inventory	Growth and Yield Manager responsible: Vivian	• PSP • Modeling	• Extensive history in program going back 80 years; data collection largely inactive in last four years due to lack of industrial interest; they claim this is a gov't function; only two G&Y foresters remaining; HQ efforts confined to managing the data. Without gov't taking this program over, may completely disappear. Data of high value for developing GY models. • VRI Section to release new VDYP7 model and adjustment protocols in 2006 that link to inventory; succession a big issue. Modeling efforts restricted to VDYP only.
"Loading" new inventory	Branch Operations: Inventory Load Unit Manager responsible: Fisher	Incorporation of VRI inventory information including re-inventory information and loading of adjusted inventory following ground sampling and analysis.	Data collection priorities and projects determined by licensees through FIA program funding model. VRI Branch Operations Section responsible for validation and processing of photo-based data to LRDW. VRI Section responsible for validation and processing of ground sample inventory attributes (non-corporate repository) and adjustment process. Load includes spatially explicit database and publishing data to the LRDW.

High-level function	Program Component	Program Sub-Components	Comments
"Updating" the inventory	Inventory Update Manager responsible: Baker	Inventory maintenance including: depletion update support from RESULTS, updating for natural disturbances. Updating for Free Growing stands Data clean up for errors in the data set.	Depletion Update is an Industry/MoFR partnership using RESULTS. It is characterized by: MoFR setting standards for update with input from industry partners; industry completing the data collection for harvesting-related disturbances and silvicultural activities; RESULTS and the Electronic Submission Framework (ESF) being implemented by the MoFR and used by all forest tenure holders; MoFR monitoring and auditing data that comes from RESULTS; and MoFR making sure that the updated VRI file is available for use by government decision-makers and third party stakeholders. It is envisioned that MoFR will meet the requirements to capture the backlog (pre-1987) Free-Growing (FG) stands, new FG stands, and the catastrophic natural disturbances with the expected efficiencies created by the partnership with the forest industry data collectors. MoFR updating and completing the data processing and data integration annually for problems inherent in the VRI data files (including but not limited to spatial and attribute ties).

High-level function	Program Component	Program Sub-Components	Comments
"Monitoring" the inventory	Not yet defined Manager responsible: Vivian +??	• National Forest Inventory • Management Unit Monitoring	• BC has committed to establish and re-measure the NFI photo and ground plots (re-measurement currently based on a 10-year schedule.) The establishment phase is essentially complete. Funding for this has come from both the feds (30 cents on the $) and from FIA. • This is a "grey" area as gov't has not made any effort to force monitoring at this level. Monitoring data uses could include: o Checking GY model output o Checking VRI adjustment longevity o Observing general trends in the inventory. o Biodiversity issues o Climate change, etc. o Changes in the land base • Note: observing differences between successive inventories does not, for the most part, qualify as "true" monitoring due to differing inventory standards; sampling issues, etc. It might be desirable to embed monitoring protocols into the VRI but this would be expensive and require legislation/industrial interest to effect.

High-level function	Program Component	Program Sub-Components	Comments
"Managing" the data	Data and Systems Manager responsible: all	VRI: includes: • Electronic field recorders (EFRs) • Oracle databases and LRDW: 1. Spatial & Attributes 2. Ground sample • Results Data Warehouse (RDW)	Management of the data is the most problematic area our program has to deal with due to highly complex gov't corporate procedures around managing data. • EFRs: we have primitive (in current terms) tools for all field sampling programs but a new platform needs to be developed in a current language (such as Windows CE) for all sampling programs. We do not want to work with any paper field sheets. • 1. Spatial & attribute data: handled by Eric's group; data stored on production Oracle d/b and a copy made once a year and put on LRDW. Expect extra activity from TFL Take-back and MPB. Rick/Tim: comments. • 2. Ground sample data: handled by VRI Section. Raw data are validated and loaded to production Oracle dbs. Data are then extracted for processing within the RDW. • The RDW is a SAS-based system of data processing used to compile sample data. All data requests for both raw and compiled come from this system.
"Accessing" the inventory	Ministry of Agriculture (LIBC) manages the LRDW Eric Fisher and Jon Vivian manage the VRI data set	○ Management Unit ○ Provincial level ○ National level	• VRI Information on Timber Supply Areas (TSAs) is currently accessible on the Land Information Data Warehouse (LRDW) through the online, Land Information BC (LIBC) Discovery Service used to search the Corporate Metadata Service. • Information on what base mapping information and air photography is available can also be found on the LIBC site. Access to the actual base mapping and air photography is through data exchange agreements or a cost to the requester. • The branch maintains a substantial sample data set which is maintained internally and not made publicly accessible. • The branch inventory staff provide expert advice and guidance on the data capture tools, the VRI data sets and models to users of the VRI • Major clients include forest service staff, forest consultants, forest industry, Ministry of Environment staff • As more tools such as Mapview, i-Map and GIS are made available at the district and regional offices we can expect more requests on how to

High-level function	Program Component	Program Sub-Components	Comments
			access and use the VRI and associated data sets. • Stakeholders are using the VRI and associated data at the stand or local level even though the VRI was never designed to be utilized at this scale.
"Reporting" the inventory	Not yet defined Manager responsible: Fisher, Vivian	○ Management Unit level monitoring ○ Provincial/National level monitoring	• In the past, the former RIB had a defined function to report out at the management unit level (TSAs). Currently, this function has not been defined nor resourced and done ad hoc basis. • The NFI is designed to report out at this level; over the next two years the NFI Project Office will work with VRI staff to develop some baseline reporting tools.

Challenge Paper Feedback Form

The Challenge Dialogue System™

Inventory Program Review: A Challenge Dialogue with Stakeholders

Executive Co-Sponsors —

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March 8, 2006

Response due: April 12th, 2006

Please send to mailto:forests.forestanalysisbranchoffice@gov.bc.ca

INPUT REQUEST 1: **Please provide your feedback (reactions, questions, suggestions) to the Key Challenge and Background statements.**

- Do you have any comments you would like to make about our Forward section regarding terms, current scope and assertions?
- What questions do you wish to raise about the Key Challenge statement?
- What ideas did the Key Challenge statement spark in your mind?
- What reactions, questions or suggestions do you have with regard to the Expected Outcomes?
- What expectations do you have for this Challenge Dialogue (as in: "I would consider this Dialogue a success if...")?

Your feedback:

INPUT REQUEST 2: **Please provide your feedback (reactions, questions, suggestions) to the Expected Outcomes.**

- What critical information or perspectives on the Background are confusing to you? Are there any other issues or events that you feel should be added or that are not relevant?
- Please refer to the Background statements by their number.

Your feedback:

INPUT REQUEST 3: **Please use the separate Feedback Document to provide your feedback (reactions, questions, suggestions) to the Assumption statements.**

- What assumptions which require more clarification for you to understand?
- What assumptions do you strongly disagree with?
- What assumptions would you like to add?
- Please refer to the Assumption statements by their number.

Your feedback:

INPUT REQUEST 4: **Please provide your feedback (answers, reactions, further questions, suggestions) to the critical questions.** ▪ What other questions would you to raise? ▪ ? Please refer to the Questions by their number.
Your feedback:
INPUT REQUEST 5: **Please provide your feedback on the Next Steps and use this space to make additional comments or raise other questions.** ▪ Do you have any comments regarding the Next Steps? ▪ What other perspectives would you like to add to this Dialogue?
Your feedback:

Copies of this form and the Challenge Paper may be downloaded at
http://www.for.gov.bc.ca/hts/inventory_prog_rev.htm